No. 719,153. PATENTED JAN. 27, 1903.

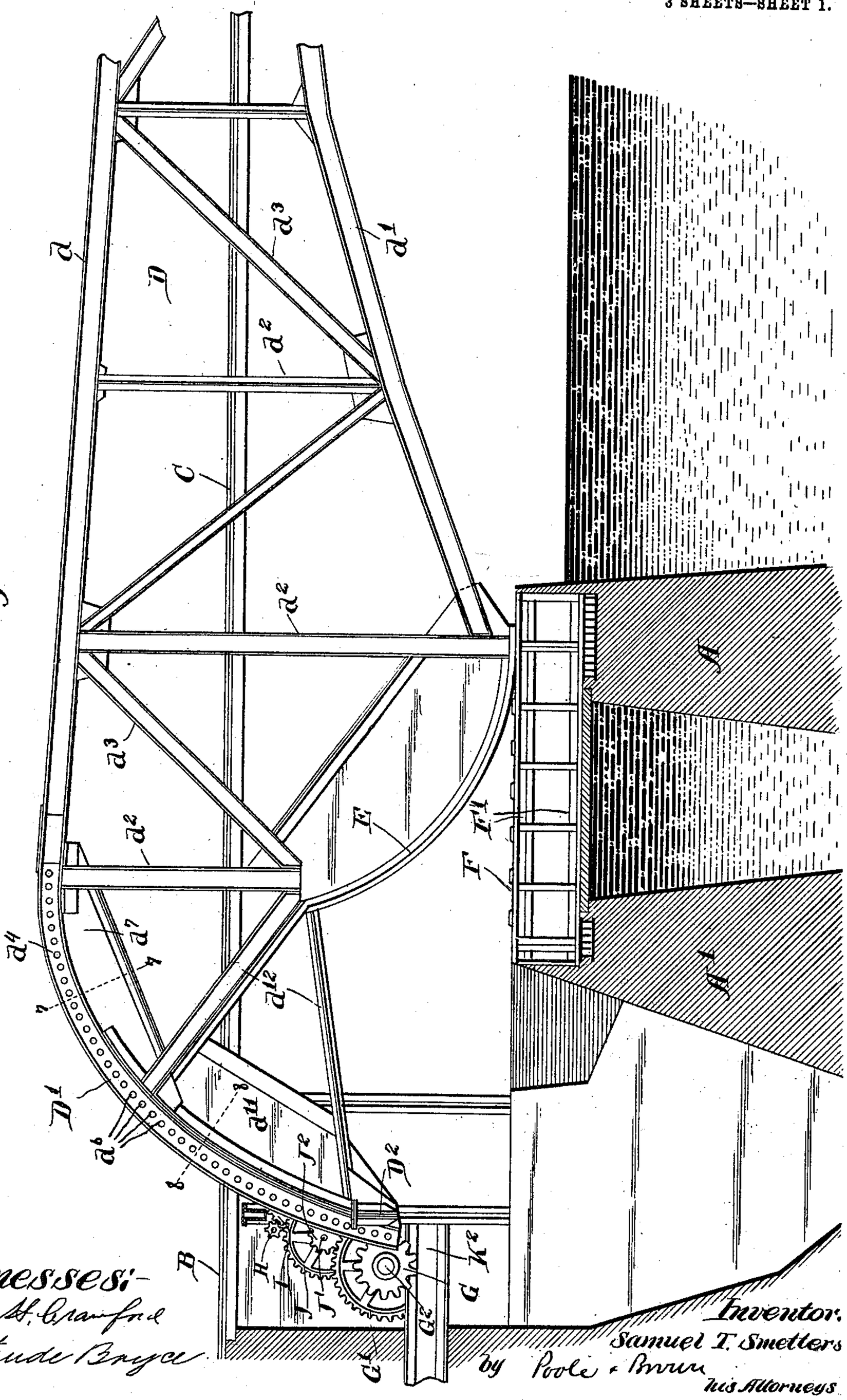
S. T. SMETTERS.

ROLLING LIFT BRIDGE.

APPLICATION FILED APR. 8, 1901.

NO MODEL. 3 SHEETS—SHEET 1.

Fig 1



Witnesses:-
Carl St. Crawford
Gertrude Bryce

Inventor:
Samuel T. Smetters
by Poole & Burn
his Attorneys

No. 719,153. PATENTED JAN. 27, 1903.

S. T. SMETTERS.

ROLLING LIFT BRIDGE.

APPLICATION FILED APR. 8, 1901.

NO MODEL. 3 SHEETS—SHEET 2.

Fig 2

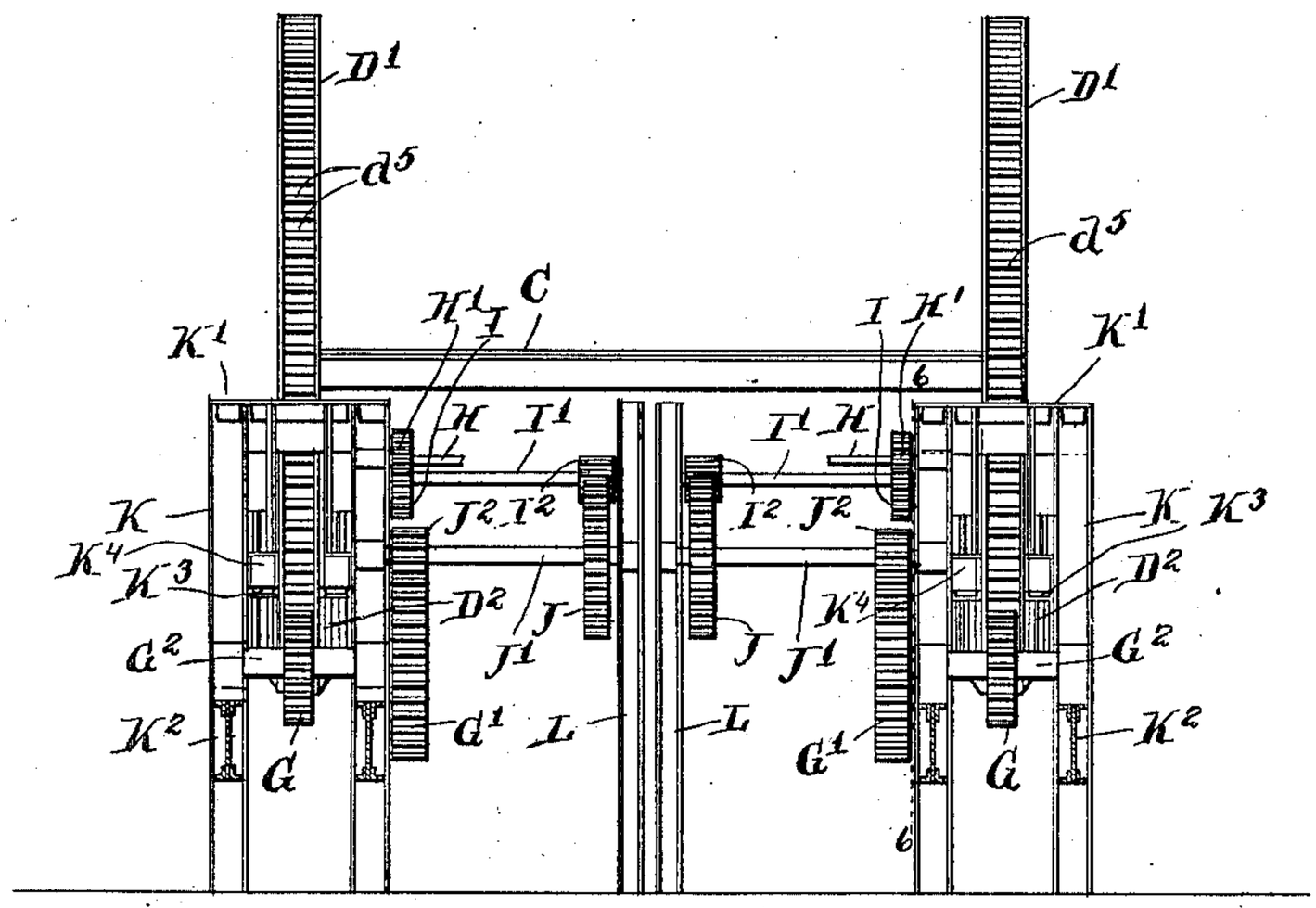


Fig 5

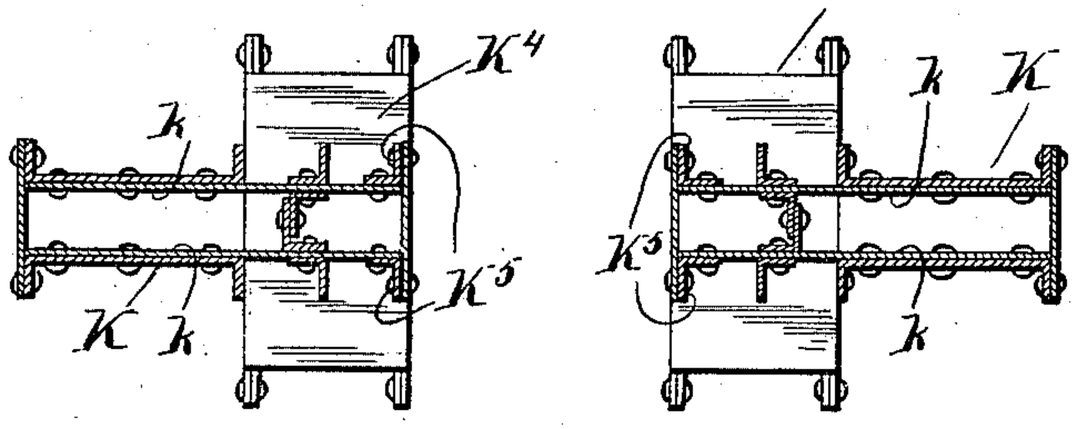


Fig 6

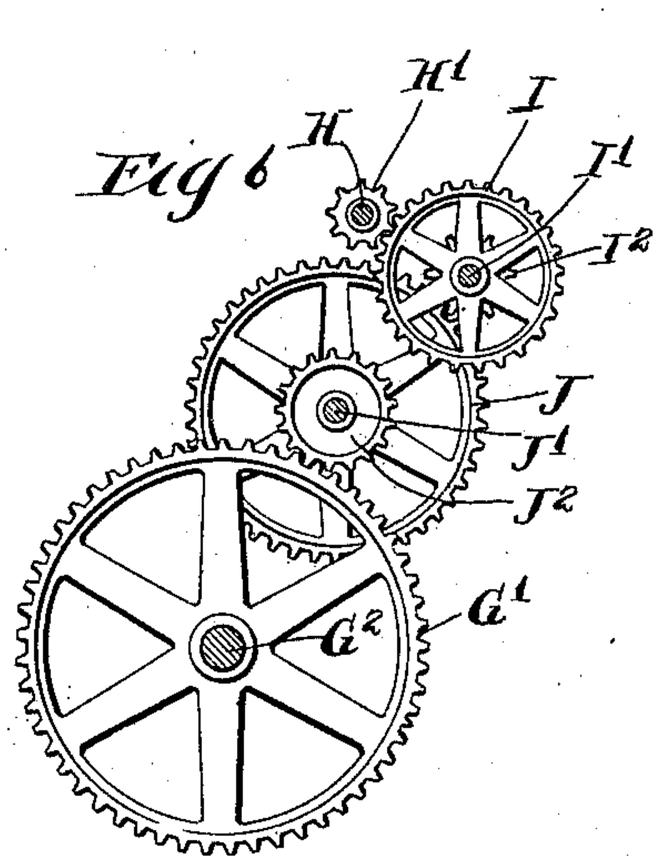


Fig 8

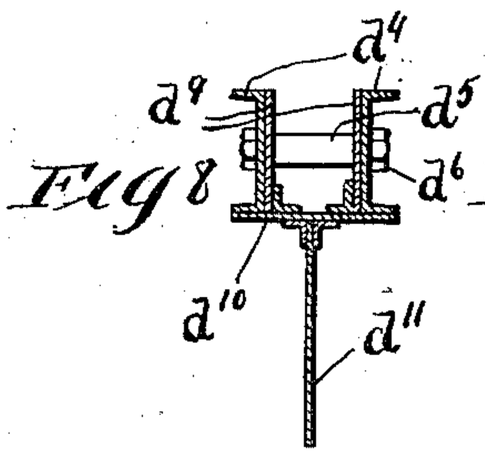
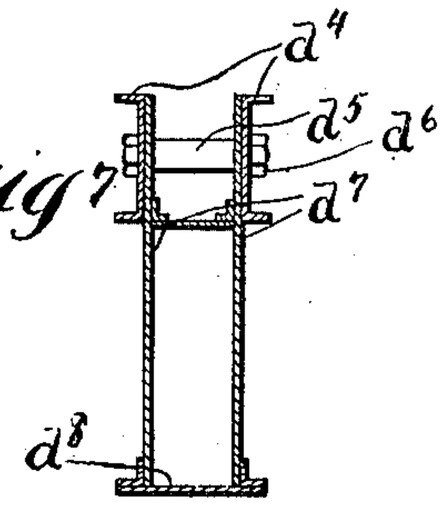


Fig 7



Witnesses:
Carl H Crawford
Gertrude Bryce

Inventor:-
Samuel T. Smetters
by Poole & Brown
his Attorneys

No. 719,153. PATENTED JAN. 27, 1903.

S. T. SMETTERS.

ROLLING LIFT BRIDGE.

APPLICATION FILED APR. 8, 1901.

NO MODEL. 3 SHEETS—SHEET 3.

Fig 3

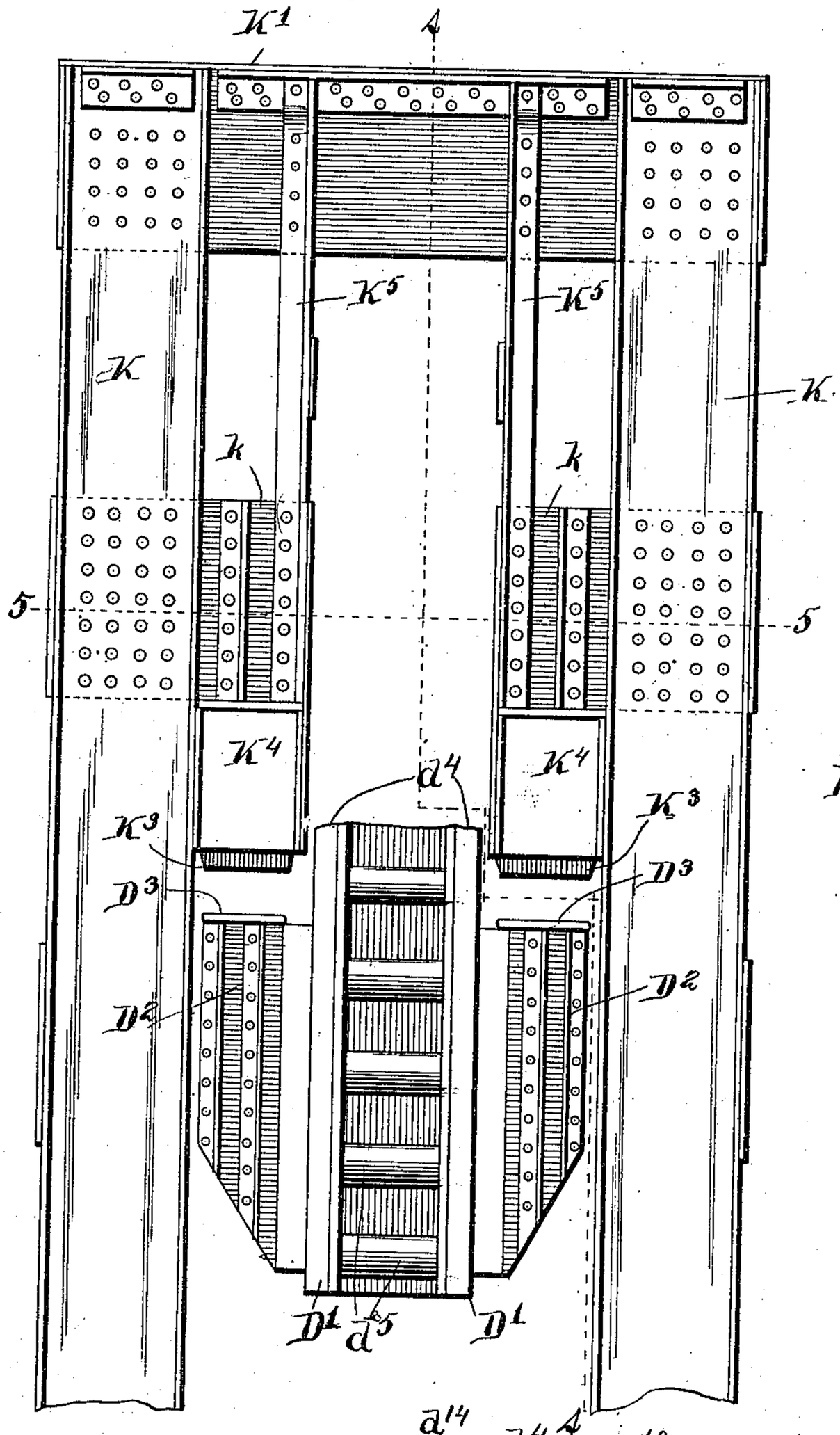


Fig 4

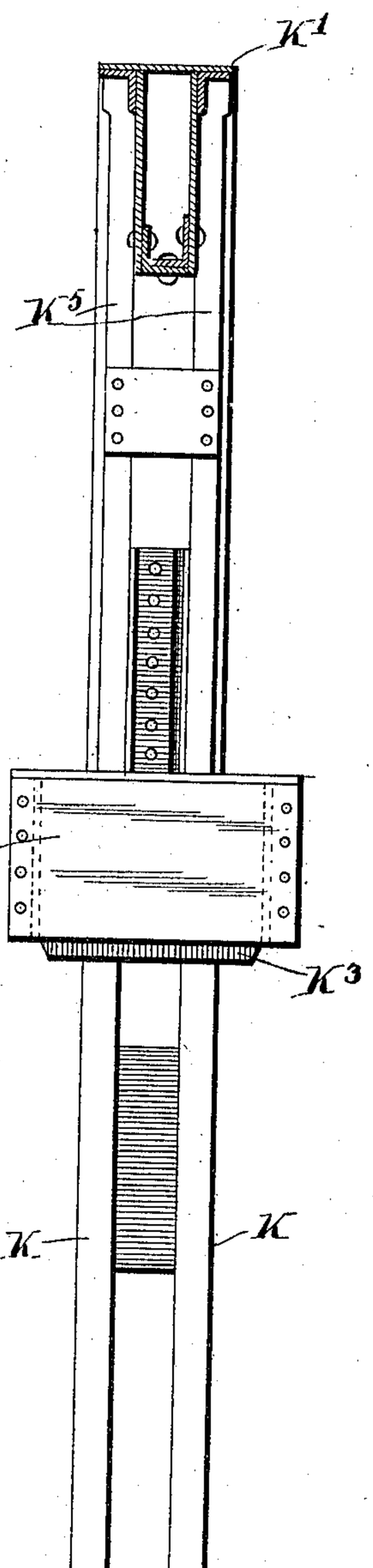


Fig 10

Fig 9

Witnesses:-
Earl S. Crawford
Gertrude Bryce

Inventor:-
Samuel T. Smetters
by Poole & Brown
his Attorneys

UNITED STATES PATENT OFFICE.

SAMUEL T. SMETTERS, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE SCHERZER ROLLING LIFT BRIDGE CO., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

ROLLING LIFT-BRIDGE.

SPECIFICATION forming part of Letters Patent No. 719,153, dated January 27, 1903.

Application filed April 8, 1901. Serial No. 54,814. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL T. SMETTERS, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Rolling Lift-Bridges; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in lifting bascule bridges of that class wherein the bridge is opened and closed by rolling or rocking movement of the span or spans, such as is shown in Letters Patent No. 511,713, issued December 26, 1893, to Wm. Scherzer.

Among the objects of my invention is to improve and simplify the construction of the bridge in the parts thereof immediately associated with the actuating mechanism and to improve the general construction and arrangement of the actuating mechanism, whereby the bridge may be opened or closed with an economical expenditure of power and whereby also lateral strains on the bridge structure during the opening and closing movement thereof are avoided.

The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a view, principally in side elevation, of the shoreward end of a rolling lift-bridge embodying my invention, certain parts thereof being shown in vertical section. Fig. 2 is a rear elevation of the bridge-span and driving mechanism therefor. Fig. 3 is a view, showing on an enlarged scale and in rear elevation, the upper part of a frame which supports the driving mechanism, showing the relation thereto of the rack on the bridge structure constituting a part of the actuating mechanism. Fig. 4 is a vertical section on line 4 4 of Fig. 3. Fig. 5 is a transverse section on line 5 5 of Fig. 3. Fig. 6 shows the gears and pinions of the mechanism for one side of the bridge, said view being taken on line 6 6 of Fig. 2. Figs. 7 and 8 are views showing transverse sections on lines 7 7 and 8 8 of Fig. 1. Fig. 9 is a face view of a fragment of one of the rack members, showing the means of attaching the studs constituting the rack-teeth thereto. Fig. 10 is a view showing a section on line 10 10 of Fig. 9.

As shown in said drawings, A A′ designate outer and inner shore-piers, and B the approach to the bridge, said approach being supported on the bridge-abutment at the level of the roadway C. The leaves shown consist principally of two trusses, one at each side of the roadway, said trusses consisting principally of upper and lower longitudinal truss members d d', joined by transverse struts and diagonal braces d^2 d^3. I have herein illustrated the shoreward end of one leaf of a two-leaf span to show the application of my invention thereto; but it is to be understood that the improvements may be embodied in a bridge-span having a single leaf, the outer end of the single leaf meeting an abutment at its lifting end, or in the case of a double-leaf span the leaves meeting each other at their inner ends, as common in this class of bridges. The said trusses at the shoreward end of the leaf B are provided at their lower sides with two curved bearers E, which are adapted to rest and roll on horizontal plates F, supported on horizontal girders F′, which are supported at their ends on the piers A A′. The shoreward end of the leaf is anchored to the abutment to take the stress of the live load of the bridge, said leaf for this purpose being provided with stop projections D^2, which engage downwardly-facing stops K^3, attached to or formed on columns K, which are suitably anchored in the abutment by means which prevent the same from rising. The plates F are shown as provided with teeth or projections which engage recesses in the curved bearers to hold the leaf from shifting on its supports, as shown in said Scherzer patent hereinbefore referred to.

Attached to the rearward extensions of the trusses are curved racks D′, which are located in the planes of said trusses and rigid therewith, said racks engaging driving-pinions G, forming parts of an actuating mechanism for the bridge. As herein shown, the racks D′ constitute rearward and downward extensions of the upper longitudinal truss members d. As more clearly shown in Figs. 7 and

8, the racks each consist principally of two curved channel-bars d^4 d^4, attached at their upper ends to the truss members d, as shown in Fig. 1, and studs d^5, extending between said bars and constituting rack-teeth. Said studs extend through the channel-bars and are provided at their outer ends, outside of said bars, with nuts d^6. Attached to said channel-bars d^4 at the upper parts of the racks are flat parallel stiffening plates or webs d^7, Fig. 8, which overlap at their upper margins the inner faces of the channal-bars and are apertured for the passage of the rack-studs therethrough. Said plates d^7 are considerably wider than the channel-bars, and their lower margins are connected by a plate d^8, suitably secured thereto. Below said stiffening plates or webs the channel-bars are strengthened by similar plates d^9, Fig. 8, which rest against the inner faces of and are made no wider than said bars and which are also apertured for the passage of the rack-studs therethrough. Said plates d^9 and the channel-bars are connected at their lower margins by a curved plate d^{10}, and attached to said plate d^{10} is a single vertical stiffening-web d^{11}. Said curved racks are attached to the outer ends of radial braces d^{12}, forming parts of the truss structure. The channel-bars d^4 d^4, together with the stiffening-plates d^7 and d^9, which are attached to their inner faces, constitute the parallel longitudinal curved side members of the racks D', the teeth of which are formed by the studs d^5, which extend between the said rack members. The construction described obviously affords a very rigid structure to withstand the strain brought thereon when the force of the actuating mechanism is exerted thereon to raise or lower the leaf, the rack members constituting, in effect, longitudinal extensions of the upper truss members and parts of the truss structure.

In the present construction the driving-pinions G are stationary and the racks D' are made of such curvature as to properly intermesh with the pinions in all of the positions of the bridge notwithstanding the rolling of the leaf upon the plates F as the leaf opens and closes. The driving mechanism on both sides of the span are alike, and both of said driving mechanisms are operated from a motor-shaft H, which may be connected with any suitable motor. (Not shown.) Each of the pinions G is driven from said shaft through a train of gears consisting of a pinion H' on each end of the motor-shaft, which meshes with a gear-wheel I on a shaft I', a pinion I^2 on said shaft I', which meshes with a gear-wheel J, fixed to a shaft J' and having thereon a pinion J^2, which meshes with a larger gear-wheel G', which is mounted on the shaft G^2, which carries the driving-pinion G. The outer ends of the shafts I' J' and both ends of the shaft G^2 may be and are desirably supported on the anchoring-columns K K, rearwardly-extending horizontal girders K^2, connected at their forward ends with columns and supported at their rear ends in any suitable manner, sustaining the journal-boxes for the shaft G^2. The inner ends of the shafts I' J' are supported on parallel columns L, which are fixed to the abutment in any suitable manner. The upper ends of the columns are connected by a transverse beam K'. Said columns and beams are desirably made up of connected angle bars and plates in the manner illustrated in Fig. 3. The lower ends of the racks D' are located between the columns K when the leaf is in its closed position, and said racks move downwardly between said columns when the bridge is opened. Through the gear mechanism described it will be seen that rotation of the motor-shaft in one direction will cause the leaf to be raised and the reversal of direction of rotation of the shaft will cause the leaf to be lowered or closed.

In the present instance the stop projections are formed on or attached directly to the curved rack D', said projections extending oppositely and laterally therefrom, and the stops K^3 on the columns extend inwardly from the columns in the paths of the projections. Said stop projections are constructed of connected pieces of angle bars and plates and provided with crown plates or caps D^3 D^3. The said stops K^3 are shown as formed by wooden blocks, which are inserted in downwardly-opening boxes K^4 K^4, consisting of connected top and side walls, as shown in Figs. 3, 4, and 5, and attached by means of webs k to the standards K. Vertical struts K^5, connected at their lower ends with said boxes and at their upper ends with the horizontal beams K', take part of the upward thrust brought upon said stops.

In Figs. 9 and 10 is illustrated a means of connecting the studs d^5, forming the rack-teeth, to the parallel side members of the rack. In said figures the studs d^5 are shown as consisting of short round rods, which, as before stated, pass at their ends through the side members of the rack formed by the plates d^7 d^9 and the channel-bars d^4. Said studs are provided outside of the side members of the rack with screw-threaded nuts, which hold the same in place. Said studs are held from rotative movement with respect to the side members under the torsional strain given thereto by engagement with the pinions by means of pins d^{14}, which pass diagonally through the ends of the studs at the sides thereof and into the side members of the rack, as shown in Fig. 10. The outer ends of the pins are upset, as shown in Fig. 10, to insure their retention in place. The rack-studs being made of the same diameter throughout their length permits the studs to be removed in case of breakage or wear thereon, such removal being effected by first removing the nuts and pins, when the studs may be slipped endwise out of place.

The construction described, comprising a truss member for a bridge-leaf of the charac-

ter set forth provided with a curved rack which is located in the plane of the truss and adapted for engagement with a rotating pinion constituting part of the actuating mechanism, is a feature of much practical importance, for the reason that the lifting force of the actuating mechanism is exerted in the plane of the truss, and thereby avoids lateral thrust and stress on the truss such as would tend to turn the truss bodily on its supporting-plate F and to throw torsional strains on the truss under the action of the load on its outer end, such as would occur if the rack D′ were located at one side of the plane of the truss. With my construction, therefore, there is no tendency to rack the bridge structure by torsional strain brought upon the various members constituting the structure when the same is opened and closed. Moreover, the construction described, wherein the racks constitute parts of the truss structure, is of considerable practical importance, as it results in a great saving of metal, makes the structure very compact, and enables the bridge to be built more economically.

It is obvious that changes may be made in the details of construction without departing from the spirit of my invention, and I do not, therefore, wish to be limited to such features except as hereinafter made the subject of specific claims.

I claim as my invention—

1. A rolling lift-bridge leaf embracing trusses and curved racks which constitute parts of the longitudinal members of the trusses and are located in the planes of the said trusses, and gear-pinions forming parts of the actuating mechanism and intermeshing with the said racks.

2. A truss for a rolling lift-bridge embracing a curved rack forming one of the truss members.

3. A truss for a rolling lift-bridge embracing a curved rack which forms a part of the upper longitudinal truss member.

4. A rolling lift-bridge leaf embracing curved racks which form the upper truss members of rearward extensions of the trusses, and gear-pinions forming parts of a gear-actuating mechanism intermeshing therewith.

5. A lift-bridge having a truss provided at one end with a curved part adapted to rest and roll upon a supporting-surface and with a rearward extension located in the plane of the truss and provided with a curved rack which forms the upper truss member of said rearward extension, and a gear-pinion forming part of a gear-actuating mechanism and adapted to intermesh with said rack.

6. A lift-bridge leaf embracing curved racks attached to the bridge structure in the planes of the trusses thereof, and forming parts of endwise extensions of the trusses, gear-pinions forming parts of a gear-actuating mechanism intermeshing therewith, and means for limiting the closing movement of said leaf embracing stop projections located at either side of the said extensions.

7. The combination with two parallel columns provided with inwardly-extending stops of a truss provided with a curved part adapted to rest and roll on a supporting-surface and having a rearward extension provided with a curved rack, said extension being located between said columns and being provided with laterally-extending stops adapted for contact with the stops on the columns.

8. The combination with two parallel columns joined by a horizontal beam at their upper ends and provided with two inwardly-extending stops rigidly connected with the columns and said beam, and a truss provided with a curved part adapted to rest and roll on a supporting-surface and with a rearward extension provided with a curved rack-bar, said rearward extension being located between said columns and provided with laterally-extending stops adapted for contact with the stops on the said columns.

9. A lift-bridge leaf embracing trusses provided with endwise extensions and with curved racks which constitute supporting members of such endwise extensions of the trusses, and which are located in the planes of said trusses, gear-pinions forming parts of a gear-actuating mechanism and which intermesh with said racks, and stop projections on the said racks adapted to engage stops on the bridge structure to limit the closing movement of the span.

10. A truss for a rolling lift-bridge embracing a curved rack composed of laterally-separated curved bars attached to and forming extensions of the upper truss member, and studs extending between said bars and attached at their ends thereto and forming the teeth of said rack.

11. A truss for a rolling lift-bridge embracing a curved rack composed of laterally-separated plates attached to and forming extensions of the upper truss members, stiffening-plates attached face to face to said bars, and studs extending between said bars and passing at their ends through said plates and bars and forming the teeth of the rack.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 19th day of March, A. D. 1901.

SAMUEL T. SMETTERS.

Witnesses:
C. CLARENCE POOLE,
WILLIAM L. HALL.